
Technical Procedure for Serial Number Restoration

1.0 Purpose – To outline the procedures in the restoration of obliterated or altered serial numbers or other manufacturer's markings on firearms and other items.

2.0 Scope – This procedure applies to any metallic evidence submitted to the Firearms Unit on which markings have been completely or partially obliterated or altered.

3.0 Definitions

- **Characters** – Symbols, numbers, letters, etc. that constitute a serial number.
- **Etchant** – A chemical that produces a corrosive action on material such as metal.
- **Magnaflux** – A commercial manufacturer of magnetic particle inspection products.
- **Solvent** – Usually a liquid used to dissolve or disperse another substance.

4.0 Equipment, Materials, and Reagents

- Stereomicroscope
- Rotary grinding tool
- Magnet
- Horseshoe magnet or electro-magnetic yoke
- Magnaflux baths (9CM and/or 7HF)
- Fry's Reagent
- Turner's Reagent
- Davis Reagent
- 25 % Nitric acid
- 10 % Sodium hydroxide
- Ferric chloride
- Acidic ferric chloride
- Cotton-tipped swabs
- Disposable pipettes
- Distilled water
- Deionized water
- Polishing compound
- Sandpaper
- Fume hood
- Personal protective equipment

5.0 Procedure

5.1 Serial Number Restoration

5.1.1 Item Preparation

5.1.1.1 Prior to examination, ensure that any additional service requests (e.g., Forensic Biology, Trace, Latent, etc.) that shall be completed before analysis by the Firearms Unit have been completed. This may be verified by examining one, or a combination of, the following:

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- 5.1.1.1.1 The status of other case records in Forensic Advantage (FA).
 - 5.1.1.1.2 The chain of custody.
 - 5.1.1.1.3 Markings from other Forensic Scientists on the evidence packaging.
 - 5.1.1.2 Wear personal protective equipment, such as gloves, lab coat, and/or safety glasses, if the item may be contaminated with a biohazardous material (blood or other potentially infectious material).
 - 5.1.1.3 Visually inspect the item for possible trace evidence such as hair, fibers, wood, etc. Note the location on the item where the trace material was found. Carefully remove the material and place in a container suitable for return to the submitting agency or submission to the appropriate Laboratory Section for further examination.
 - 5.1.1.3.1 If the trace material is not to be retained, indicate as such in the case notes.
 - 5.1.1.4 Items contaminated with blood, body matter or other biological material shall be cleaned with a soft bristle brush and a disinfectant such as Terg-A-Zyme, Hibiclens, and/or ethanol.
 - 5.1.1.5 Items may generally be cleaned with a cotton-tipped swab saturated with ethanol, acetone, and/or cartridge case cleaner.
 - 5.1.1.6 Mark all evidence items for identification.
 - 5.1.1.6.1 Do not mark on possible manufacturer markings.
 - 5.1.1.6.2 Mark with the item designation number (Q or K number), laboratory case number, and initials.
 - 5.1.2 **Visual Examination**
 - 5.1.2.1 Make note of the position of the serial number area and the area's physical property (e.g., magnetic or non-magnetic).
 - 5.1.2.2 Determine, if possible, the location, size, style (font), hidden numbers and the number of characters typically found in the serial number of the item in question. Record the source(s) of this information if used, such as the Firearms Reference Collection, the Firearms Reference Table (Royal Canadian Mounted Police), or the BATFE Firearm Serial Number Structure Guide.
 - 5.1.2.2.1 On firearms with hidden serial numbers, disassembly of the firearm and/or removal of material may be necessary to reveal this number. Record in the case notes any action taken to reveal a hidden serial number.
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5.1.2.3 Note the method of obliteration (e.g., scratched, gouged, ground, drilled, peened, punched, chemically etched, etc.).

5.1.2.4 Record the “as received” condition observed during the initial examination including any discernible or partial characters and their position prior to any processing.

5.1.3 Preparing the Surface

5.1.3.1 Polishing the surface may be used to remove obliteration scratches that obscure the serial number. Polishing may be effective independently, but is more often used in conjunction with various chemical procedures.

5.1.3.2 Polish the area of obliteration using a rotary grinding tool with a soft polishing stone attached, or other appropriate method.

5.1.3.3 Depending on the extent of obliteration, continue polishing until the surface is mirror-like, removing all scratches. If the obliteration is severe, it may not be possible or desirable to remove all the scratches.

5.1.3.4 Note any discernible characters and the position of these characters after polishing/smoothing.

5.1.4 Magnetic Particle Inspection Method

5.1.4.1 The Magnetic Particle Inspection Method is a non-destructive technique and shall be utilized prior to chemical processing, if appropriate.

5.1.4.2 Using a plastic pipette, apply magnetic particle solution (Magnaflux bath) to the serial number area while applying a magnetic field through the use of either the horseshoe magnet or electro-magnetic yoke.

5.1.4.3 It may be necessary to use the magnetic particle method in conjunction with chemical processing to restore the serial number.

5.1.4.4 Note the method(s) used, any characters that become discernible, and the position of these characters.

5.1.5 Chemical Processing Method

5.1.5.1 Select a chemical etchant appropriate for the material in question.

5.1.5.1.1 **For use on magnetic material**, such as steel (listed in order of strength from strongest to weakest):

- Fry’s Reagent
- Turner’s Reagent (may be used as a highlighter)
- Davis Reagent

5.1.5.1.2 For use on non-magnetic material (listed in order of strength from strongest to weakest):

- Acidic ferric chloride
- Ferric chloride

5.1.5.1.3 For use on non-magnetic aluminum media:

- 10 % Sodium hydroxide

5.1.5.1.4 25 % Nitric acid may be used as a highlighter for the above chemicals.

5.1.5.2 Etchant Quality Control (Reactivity) Check

5.1.5.2.1 Test the strength of the chemical solution in an area adjacent to the polished serial number area. Ideally, the solution should not bubble or fizz when it comes in contact with the metal, but the area should slowly darken due to oxidation. Dilute the chemical solution with distilled water as necessary. **Always add acid to water, never add water to acid.**

5.1.5.3 Apply the solution slowly by pipette, cotton-tipped swab, or other appropriate method. Gently rub across the area in one direction with a cotton-tipped swab as necessary.

5.1.5.4 More than one etchant may be used. Improved clarity is often achieved by wiping off the etchant and lightly rubbing prior to etchant reapplication.

5.1.5.5 If characters appear, distilled water may be applied to the area to slow and/or stop the oxidation process and allow for examination.

5.1.5.6 Note the method(s) used, any characters that become discernible, and the position of these characters.

5.1.5.7 Continue processing until the complete serial number is restored or the Forensic Scientist concludes that no serial number or no complete serial number can be restored.

5.1.5.8 All restoration results shall be confirmed by a second Forensic Scientist, preferably the Forensic Scientist that will perform the technical/administrative Review. If the confirmation must be performed by other than the future technical/administrative reviewer, the Forensic Scientist shall record in the case notes the name of the Forensic Scientist who confirmed the restoration results.

5.1.5.9 If a serial number is restored, the Forensic Scientist shall have the restored serial number searched through the National Crime Information Center (NCIC) Stolen Gun Files.

5.1.5.9.1 If an entry is found that matches the description of the firearm (make, caliber, model, etc) and the restored serial number, the Forensic Scientist shall notify the submitting agency via the Laboratory Report that a possible hit was made in the NCIC Stolen Gun Files and that the submitting agency should contact the agency that made the entry into NCIC to confirm the possible hit.

5.1.5.9.2 All results from an NCIC search shall be inserted into the Case Record Object Repository.

5.2 Range of Conclusions

5.2.1 The suggested report wording listed below may be modified at the Forensic Scientist's discretion to reflect more accurately his/her conclusions. Any such modifications to report wording shall be reviewed and approved with the technical review.

5.2.2 Possible results include full restoration, partial restoration, or no serial number restored. Full restoration is the total recognition of all obliterated characters. Partial restoration is the recognition of obliterated characters less than the total being sought. No serial number restored is the lack of recognition of any obliterated characters or the failure to conclusively identify a sufficient number of characters for an NCIC search.

5.2.2.1 Full Restoration, Positive NCIC Check

- "Examination and [magnetic and/or chemical] processing of the K-1 pistol restored the original obliterated serial number which was determined to be "123456". A search of the NCIC Stolen Gun Files by Serial Number "123456" revealed a possible hit from Wilmington, NC. Contact the Wilmington Police Department (reference Wilmington OCA 1234) to confirm this possible hit."

5.2.2.2 Full Restoration, Negative NCIC Check

- "Examination and [magnetic and/or chemical] processing of the K-1 pistol restored the original obliterated serial number which was determined to be "123456". A search of the NCIC Stolen Gun Files by Serial Number "123456" revealed no matching entries. If a gun trace is desired, please contact your local Bureau of Alcohol, Tobacco, Firearms, and Explosives (BATFE) Office."

5.2.2.3 Partial Restoration, Positive NCIC Check

- "Examination and [magnetic and/or chemical] processing of the K-1 pistol partially restored the original obliterated serial number which was determined to be "1234*6". The asterisk (*) represents a partially restored digit that was concluded to be most likely a "5"; however, a "6" could not be eliminated. A search of the NCIC Stolen Gun Files by serial numbers "123456" and "123466" revealed a possible hit with serial number "123456" from Wilmington, NC. Contact the Wilmington Police Department (reference Wilmington OCA 1234) to confirm this possible hit."

5.2.2.4 Partial Restoration, Negative NCIC Check

- “Examination and [magnetic and/or chemical] processing of the K-1 pistol partially restored the original obliterated serial number which was determined to be “1234*6”. The asterisk (*) represents a partially restored digit that was concluded to be most likely a “5”; however, a “6” could not be eliminated. A search of the NCIC Stolen Gun Files by serial numbers “123456” and “123466” revealed no matching entries. If a gun trace is desired, please contact your local Bureau of Alcohol, Tobacco, Firearms, and Explosives (BATFE) Office.”

5.2.2.5 No Serial Number Restored

- “Examination and [magnetic and/or chemical] processing of the K-1 pistol failed to restore a serial number (or failed to restore a complete serial number).”

5.3 Standards and Controls – For verification procedures for serial number restoration chemicals, including Fry’s reagent, Turner’s reagent, Davis reagent, 25 % Nitric acid, 10 % Sodium hydroxide, Ferric chloride, and Acidic ferric chloride, see [5.1.5.2](#).

5.4 Calibration – N/A

5.5 Maintenance – For stereomicroscope maintenance information, see the Firearms Unit Technical Procedure for Instrument Calibration and Maintenance.

5.6 Sampling – N/A

5.7 Calculations – N/A

5.8 Uncertainty of Measurement – N/A

6.0 Limitations – The type of material containing the serial number and the original method used to place the serial number on the evidence item (such as laser engraving) may prevent this procedure from restoring the serial number.

7.0 Safety – Examinations performed in the Firearms Unit are inherently dangerous. These procedures involve hazardous chemicals, firearms, and power tools. All hazardous procedures shall be performed in compliance with the State Crime Laboratory Safety Manual. If the examination involves a biohazard, the Forensic Scientist shall use proper personal protective equipment, such as eye protection, a lab coat, and/or gloves, and work within a fume hood, as appropriate.

8.0 References

The Association of Firearm and Tool Mark Examiners. The Association of Firearm and Tool Mark Examiners. Web. 14 Dec. 2011. <www.afte.org>

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United States. Bureau of Alcohol, Tobacco, Firearms, and Explosives Laboratory. *Serial Number Restoration Handbook*. 1999.

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O'Reilly, W.E. "Magnetic Restoration of Serial Number." *AFTE Journal* Spring 1970: 26-27.

Polk, Donald E. and Bill C. Gaenssien. "Metallurgical Aspects of Serial Number Recovery." *AFTE Journal* Spring 1989: 174.

Schaefer, Jeffery. "Serial Number Restoration Observations." *AFTE Journal* Summer 1987: 276-278.

Treptow, Richard S. National Aeronautics and Space Administration. *Handbook of Methods for the Restoration of Obliterated Serial Numbers* 1978.

Turley, Dennis M. "Restoration of Stamp Marks on Steel Components by Etching and Magnetic Techniques." *Journal of Forensic Sciences* May 1987: 640-649.

9.0 Records

- FA Worksheets: Main, Firearm, Serial Number, and Disposition/Result

10.0 Attachments – N/A

Revision History		
Effective Date	Version Number	Reason
09/17/2012	1	Original Document
12/07/2012	2	Added magnet to Equipment list
02/15/2013	3	Removed Raleigh from the header; 4.0 – added equipment; 5.1.1.6.2 – added “or K”; 5.1.2.3 – added “chemically etched”
11/15/2013	4	Added issuing authority to header
09/05/2014	5	Header and various subsections – corrected to reflect organizational change